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# Involvement of local Indigenous peoples in Arctic research — expectations, needs and challenges perceived by early career researchers

Ylva Sjöberg, Sarah Gomach, Evan Kwiatkowski, and Mathilde Mansoz

**Abstract:** Rapid changes in the natural and social environments of the Arctic region have led to increased scientific presence across the Arctic. Simultaneously, the importance of involving local Indigenous peoples in research activities is increasingly recognized for several reasons, including knowledge sharing and sustainable development. This study explores Arctic early career researchers' (ECRs) perceptions on involving local Indigenous peoples in their research. The results, based on 108 online survey respondents from 22 countries, show that ECRs value the knowledge of local Indigenous peoples and generally wish to extend the involvement of this group in their research. ECRs in North America and in the social sciences have more experience working with Indigenous communities and value it more than researchers in the Nordic area and in the natural sciences. Respondents cited more funding, networking opportunities, and time as the main needs for increasing collaborations. The results of this study are helpful for developing strategies to build good relationships between scientists and Indigenous peoples and for increasing the involvement of Arctic Indigenous peoples in science and engagement of their knowledge systems. The complementary views from Arctic Indigenous peoples are, however, needed for a full understanding of how to effectively achieve this.

**Key words:** early career researchers, Arctic, Indigenous peoples.

**Résumé :** Les changements rapides dans les environnements naturels et sociaux de la région arctique ont entraîné une présence scientifique accrue dans l'Arctique. En parallèle, l'importance de faire participer les peuples autochtones locaux aux activités de recherche est de plus en plus reconnue pour plusieurs raisons, notamment le partage des connaissances et le développement durable. Cette étude explore les perceptions des chercheurs (et chercheuses) en début de carrière (CDC) dans l'Arctique quant à la participation des peuples autochtones locaux à leurs recherches. Les résultats, fondés sur les réponses de 108 participants de 22 pays à un sondage en ligne, montrent que les CDC apprécient les connaissances des peuples autochtones locaux et souhaitent généralement étendre la participation de ce groupe à leurs recherches. En Amérique du Nord et en sciences sociales, les CDC ont plus d'expérience de travail avec les communautés autochtones et ils apprécient cette expérience plus que les chercheurs des régions nordiques et dans le domaine des sciences naturelles. Les participants au sondage ont évoqué la demande accrue de financement, plus de possibilités de réseautage et plus de temps comme étant les principaux besoins afin d'accroître les collaborations. Les résultats de cette étude sont utiles aux fins de l'élaboration de stratégies visant à établir de bonnes relations entre les scientifiques et les peuples autochtones et aux fins d'accroître la participation des peuples autochtones.

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de l'Arctique à la science et de favoriser l'utilisation de leurs systèmes de connaissances. Les points de vue complémentaires des peuples autochtones de l'Arctique sont toutefois nécessaires pour bien comprendre comment parvenir à ces fins. [Traduit par la Rédaction]

*Mots-clés* : chercheurs (et chercheuses) en début de carrière, Arctique, peuples autochtones.

## Introduction

Following rapid climatic and environmental changes, Arctic areas have experienced an increased presence of scientists during the past few decades (e.g., [ACIA 2004](#); [Larsen et al. 2014](#)). These environmental changes have far-reaching consequences for people living in the Arctic and beyond, especially for Indigenous peoples who are often highly dependent on their local ecosystems ([Arctic Council 2013](#)). Over time, Arctic Indigenous peoples have accumulated knowledge about the Arctic ecosystems, which is of great value for researchers studying Arctic environments and societies ([Adams et al. 2014](#)). Historically, Western science on Arctic environments and societies has not always benefited from or included the perspectives of Arctic Indigenous peoples ([Drugge 2016](#)). Although the knowledge of and observations by Arctic Indigenous peoples have been increasingly valued by scientists over the past couple of decades, subjects related to Indigenous knowledge are not usually taught to university students and young scientists (e.g., [Huntington 2011](#)). This suggests that scientists and Indigenous peoples could both benefit from working closer together around Arctic environmental and societal change issues. However, such collaborations are not easy to implement because of factors such as cultural and geographical differences (e.g., [Mistry and Berardi 2016](#)).

Arctic areas have a diverse range of human and natural landscapes and social histories, which gives rise to regional differences in the conditions to involve Indigenous peoples in research. In northern Scandinavia, the Indigenous Sami people represent 1% to 15% of the total population, whereas in Alaska and western Arctic Canada, Indigenous peoples total 15%–30% of the population. In parts of eastern Arctic Canada, Indigenous populations are the majority with >60%, and in Arctic Russia regional variations span from <1% to 30%–60% ([Nordic Council of Ministers 2015](#)). The total population density also varies across regions. Northern North American settlements are often small and isolated, whereas northern Scandinavia is more densely populated. Population centers in northern Scandinavia span from cities to small villages, and relatively well-developed infrastructure connect these centers ([Keskitalo et al. 2013](#)). Non-Indigenous peoples have also lived in northern Scandinavia longer than in North America, with large-scale colonization starting in the 18th century ([Sköld and Axelsson 2008](#)). The variability in these physical and social conditions requires researchers to understand the local conditions to effectively engage Indigenous members of these communities in research efforts. Researchers must carefully consider how Indigenous knowledge can support their research and how their research may affect Indigenous communities. Furthermore, regulations and guidelines also vary between the Arctic countries. In North America, researchers must follow guidelines and (or) acquire permits that require consultation from local communities, including Indigenous peoples — although there are substantial differences between regulations in Canada and Alaska (e.g., [NCAI 2012](#); [Government of Canada 2013](#)). In northern Scandinavia and Russia, such guidelines and permits are less common; therefore, there is less structure for researchers and Indigenous peoples to build successful collaborations (e.g., [Juutilainen and Heikkilä 2016](#)).

Within the Arctic researcher community, the knowledge and experience of involving local Indigenous peoples varies among disciplines. Some social science disciplines, such as

anthropology, have long traditions of working with local communities in research. For many natural scientists, however, this type of collaboration may be less central in their training, and the benefits to their research seem less obvious. Nonetheless, examples of studies in which Arctic Indigenous peoples have been involved in research are available from a range of disciplines including environmental change studies (Cruikshank 2001; Bennet and Lantz 2014), health (Jardine and Furgal 2010; Genius et al. 2014), ecology (Gilchrist et al. 2005; Brook et al. 2009; Knopp et al. 2012), and archaeology (Friesen 2002; Lyons 2014). Furthermore, scientists and Arctic Indigenous peoples are not always two completely separated groups, as there are many active Arctic Indigenous scientists.

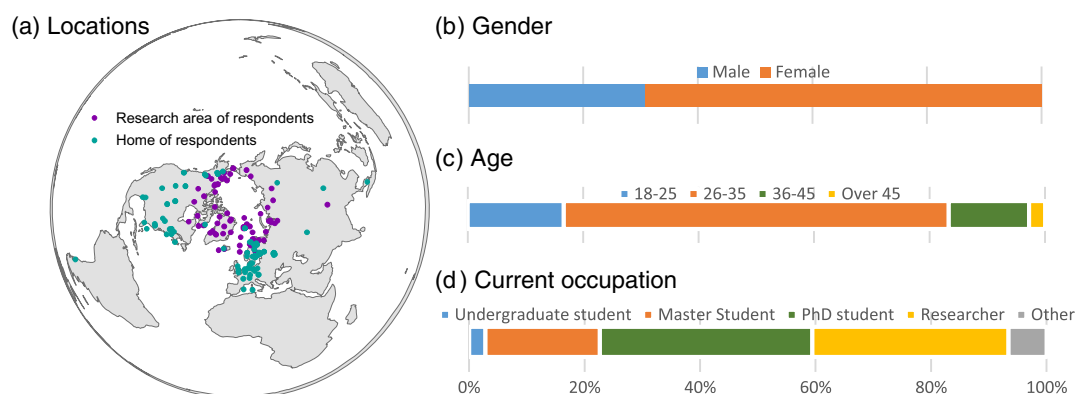
A strong focus on early career researchers (ECRs, defined here as graduate students and postdoctoral researchers) is essential to identify ways of ensuring good relationships and fruitful collaborations with Arctic Indigenous peoples for the future. ECRs face unique challenges when collaborating with local Indigenous peoples. Mutually beneficial relationships often require a long time to build, whereas ECRs are pressured to be highly productive in a limited time-frame (Adams et al. 2014; Tondur et al. 2014). Recent initiatives from Arctic ECRs show that there is interest in developing good working practices for involving Indigenous peoples in research in this community. Tondur et al. (2014) describe community-collaborative research from the perspectives of ECRs in northern Canada and formulated recommendations for successful collaborative research in that region. In Sweden, a network of ECRs within the Sami field of studies has advanced the discussion of research ethics when working with and in Sami communities (Drugge 2016). The Association of Polar Early Career Scientists (APECS) coordinated a project focusing on bridging the Arctic ECRs community and Arctic Indigenous peoples, through a series of webinars, a survey (the focus of this study), and a workshop (Bull and Juutilainen 2014). Additionally, among the permafrost ECR community, finding ways to use traditional environmental knowledge in research was ranked as one of five prioritized forward-looking permafrost research questions (Fritz et al. 2015). However, few studies explore the bases of such collaborations, hence the needs, challenges, and expectations for such endeavors to remain largely unclear.

This study is the outcome of an international project spearheaded by ECRs to bridge the gap between ECRs and Arctic Indigenous peoples. The study was based on a survey of the existing interactions of ECRs with Arctic Indigenous peoples, and the objectives of the study were (a) to identify the expectations, needs, and challenges for successful interactions and collaborations between the two groups; and (b) to explore regional and disciplinary differences in these issues. It should be noted that this study highlights only one side of a two-sided story, as any successful collaboration between western scientists and Indigenous peoples need to be mutually beneficial. Perspectives of Indigenous peoples are therefore needed for a complete understanding of how knowledge about the Arctic can best be produced in the future. With this study, we hope to open the door, from the Arctic ECR side, for further efforts in bridging the gap between Arctic ECRs and Indigenous peoples.

## Materials and methods

The study, as part of the project *Bridging Polar Early Career Researchers and Indigenous Peoples in Nordic Countries*, led by APECS and UiT The Arctic University of Norway, is based on a survey designed to map existing interactions, expectations, needs, and challenges among ECRs when involving Arctic Indigenous peoples in their research. The survey consisted of a combination of open-ended, multiple-choice, and rating scale questions. The first section of the survey focused on biographic information, the second on the experiences and perceptions of ECRs working with Indigenous communities, and the third on ECRs' opinions on opportunities and challenges for increased involvement of Indigenous communities in Arctic research. The survey was made available online in English, Swedish, Finnish,

**Fig. 1.** Respondents' location (a), gender (b), age (c), and occupational (d) distributions.



Danish, Russian, and North Sami. Invitations for participation in the survey were distributed through the APECS network communication channels (email lists, Facebook pages, and the APECS web page) during the first half of 2014.

The survey attracted 123 responses in total, of which 114 were in English, 4 in Russian, 3 in Swedish, and 2 in North Sami. After eliminating incomplete survey responses, duplicate responses (based on email address provided by respondents), and survey responses which came from senior scientists (more than 10 years of professional experience and not student or postdoctoral researcher, as indicated in the survey), 108 responses remained and were analyzed.

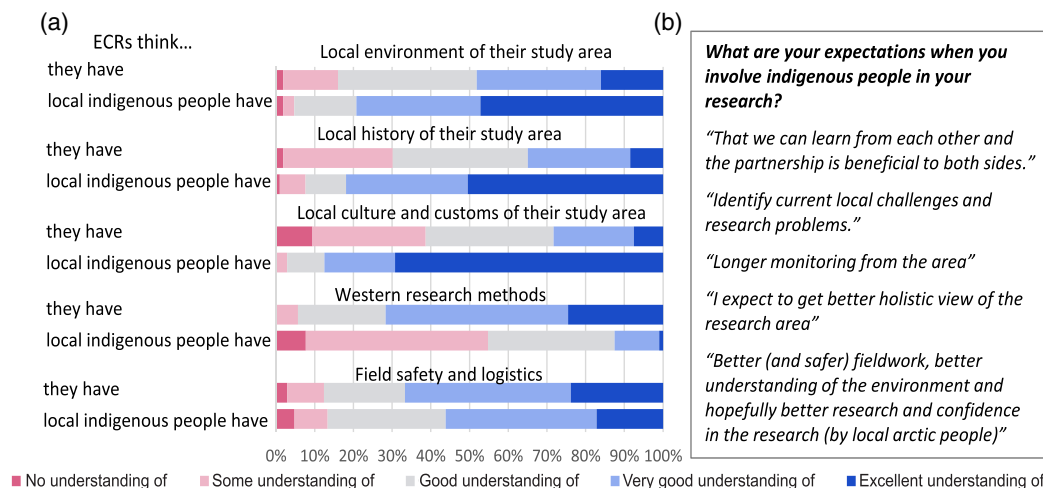
Rating scale data were analyzed using the Wilcoxon–Mann–Whitney test for testing group differences. Gender (female/male), regional (Nordic/North American), and disciplinary (natural/social) groups were analyzed, as well as groups of Indigenous researchers versus non-Indigenous researchers. The Nordic regional group ( $n = 22$ ) were those respondents with study areas in northern Norway, Sweden, Finland, and northwestern Russia, approximately corresponding to the geographical area of the Sami Indigenous people. The North America regional group ( $n = 24$ ) included respondents with study areas in northern Canada and Alaska. Respondents with study areas in Siberia, Greenland, Svalbard, and the Arctic Ocean were not included in the regional comparison, because each of these groups represented a sample size that was judged too small for statistical purposes. The two disciplinary groups were natural scientists ( $n = 68$ , see [Appendix A](#) for definition) and social scientists ( $n = 27$ , see [Appendix A](#) for definition). Thirteen of the respondents did not fall into either of the two disciplinary groups. The Indigenous researcher group ( $n = 9$ ) consisted of those respondents who had endorsed “I am a polar researcher and Indigenous”, and the non-Indigenous group consisted of all other respondents.

## Results

The survey respondents' research areas spanned the entire Arctic region. The majority of respondents were female between 26 and 35 years old ([Fig. 1](#), [Appendix A](#)). Although 23% of the respondents lived above  $60^{\circ}\text{N}$ , most of them lived relatively far south of their study areas in the Arctic ([Fig. 1](#)). Aggregated results for all respondents and all questions are shown in [Appendix C](#).

The survey respondents were split equally (50%/50%) among ECRs that had interacted with Indigenous populations for their research and those who had not. Most of the respondents agreed strongly or very strongly that the involvement of local Indigenous peoples

**Fig. 2.** Responses on how ECRs view their own and Indigenous peoples' understanding of different aspects relevant for Arctic research (a). Selected quotes demonstrating the expectations of ECRs when involving Indigenous people in research (b).



could be beneficial for their research and that the involvement of local Indigenous peoples in research was essential for the sustainable development of the Arctic region. The knowledge and experience of local Indigenous peoples were also perceived as an untapped resource for Arctic research.

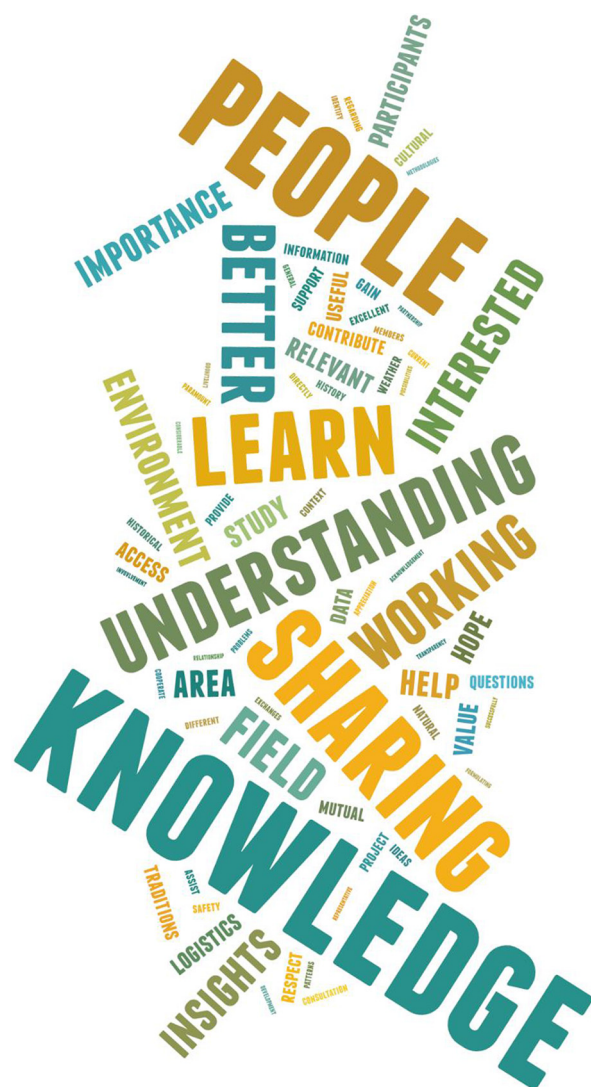
ECRs perceived local Indigenous peoples' understanding of the local environment, history, culture, and customs of their study areas as better than their own (Fig. 2). However, ECRs perceived their own understanding of western research methods as better than that of local Indigenous peoples and perceived the understanding of logistics and field safety as similar for the two groups. When asked about their expectations for involving local Indigenous peoples in research, respondents highlighted (i) the sharing of knowledge, (ii) gaining a better understanding of the local environment, (iii) history and culture, and (iv) finding ways to identify relevant research questions as the most important (see sample quotes in Fig. 2b).

Several respondents emphasized that they expected the involvement of Indigenous peoples to require patience (see quotes in Appendix C, question 22), and many highlighted that they expect a sharing of knowledge, as illustrated in Fig. 3. Entering into these collaborations, several ECRs did not indicate any prevailing prior expectations, but rather that they had hopes for generally positive outcomes (Appendix C, question 22). When asked how the involvement of local Indigenous peoples benefits their research, a majority said that it provided a better understanding of the local environment and history and that it increased the outreach of the research. Around 40% of the respondents also indicated that it provided better field safety and helped avoid conflicts with local people.

Among the respondents, 79% expressed that they would like to have more involvement of local Indigenous peoples in their research. This was true for involvement in field work (59% of respondents), outreach activities (54%), and research design (48%). Financial resources ranked highest as a need for increasing the involvement of Indigenous peoples (58%), as well as more contacts and networking opportunities (52%), and more time (41%). Respondents also suggested that more forums for networking and meeting Indigenous youth and elders (e.g., including more Indigenous peoples and interests at scientific



**Fig. 3.** Word cloud, in which the sizes of the words are scaled by the number of appearances of the words in the responses to question 22: “Based on your observations and experience, what elements would contribute to establish fruitful cooperation work between polar ECRs and Indigenous youths?” (Appendix C). (Word cloud generated by the Tagxedo online software, <http://www.tagxedo.com>).



conferences) would be helpful for establishing fruitful collaborations (Fig. 4). They were also interested in sharing their research findings with the local communities and provided several suggestions on how this could be done through local presentations and discussions at schools or other community facilities (Appendix C, Question 24).

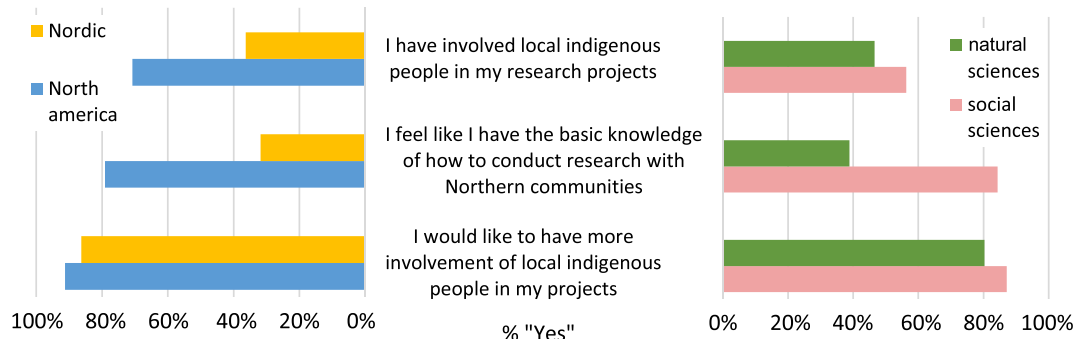
Although a majority of the respondents want to involve more Indigenous peoples in their research, only 50% of the respondents felt that they had the basic knowledge of how to conduct research involving northern Indigenous communities. ECRs who have involved or shared research with local Indigenous peoples are generally satisfied with the results, but some have also experienced conflicts or frustration. The respondents indicated several challenges, including language and cultural differences, lack of time and communication, and different analytical thinking and methods.

**Fig. 4.** Sample quotes from open-ended question for ideas on how to establish fruitful cooperation between ECRs and Indigenous people (question 27, [Appendix C](#)).

**Based on your observations and experience, what elements would contribute to establish fruitful cooperation work between polar ECRs and Indigenous youths?**

- “Networking (via blog and forum). It would be very interesting to have a conference happening in the North, for example in Iqaluit. We could expect a lot of indigenous people going there since it's closer for them.”
- “Perhaps more fora to meet? E.g wider events for polar topics, where indigenous youth would be natural participants, rather than a strict research/academic setting, where it would seem very forced and unnatural.”
- “Simply the opportunity to interact with Indigenous youth in some capacity; all of my prior work has kept me relatively isolated from the indigenous population in general such that I interact predominantly with science support staff.”
- “actively involved participants on both sides and common goals/shared vision”
- “published protocols, suggestions, guidelines on how, where and with whom to establish links with indigenous youth, startup of reciprocal exchange programs between communities and universities”
- “Face to face visits, engaging indigenous researchers”
- “Conflict resolution skills, acceptance for complimentary knowledge paths, ideally spending time with the communities and especially youth and elders”
- “Deep understanding of the cultural differences that make a difference”
- “Being able to have time to meet and discuss everyone's needs and aims. Right now, with funding it is hard to make that time. But, it is the first thing to get criticized.”
- “involvement of young indigenous representatives in the study group, but as full-fledged colleagues”
- “give first before asking”

**Fig. 5.** Group differences for yes/no questions.

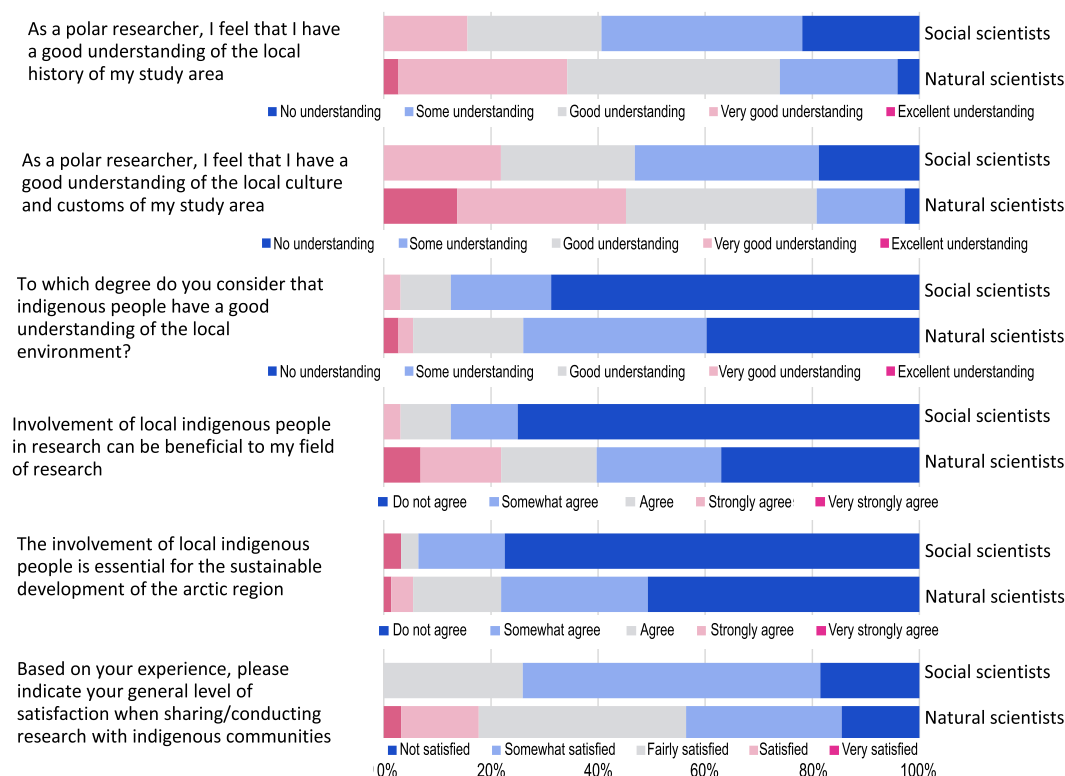


Compared with the natural scientists, social scientists were slightly more experienced in involving Indigenous peoples in their research (Fig. 5). They also indicated markedly higher confidence in their knowledge of how to conduct research with northern communities. Some significant ( $p < 0.05$ ) differences were found in the rating scale answers between these two groups (Fig. 6, [Appendix D](#)). On average, social scientists rated the benefits and their satisfaction of involving local Indigenous peoples in research higher than natural scientists did.

Nordic region respondents had markedly less experience involving local Indigenous peoples in their research compared with their North American counterparts. They also indicated much less confidence in their knowledge of how to do this. Both groups, however, would like to have more involvement of local Indigenous peoples in their research. Respondents doing research in North America felt that involving local Indigenous peoples



**Fig. 6.** Questions that were rated differently ( $p < 0.05$ ) by social and natural scientists.



could be beneficial to their research to a higher degree than the respondents in the Nordic region. They were also more satisfied with their collaborations with Indigenous peoples compared with the Nordic respondents.

The gender composition was similar between the compared regional and disciplinary groups (female respondents in the Nordic group = 82%, North American group = 83%, natural scientist group = 66%, and social scientist group = 67%), but the data also revealed some gender differences. Female respondents on average rated the knowledge of Indigenous peoples higher than male respondents did (Appendix D, questions 15a–c) and found more benefits in involving Indigenous peoples in their research (Appendix D, question 16).

Although the Indigenous researcher group was much smaller than the non-Indigenous group (Appendix A), looking into differences between these two groups can provide some insight into the other side of this story — the perceptions of Indigenous peoples. The Indigenous group rated their understanding of local history and culture higher than the non-Indigenous group (Appendix D, questions 14b–c). The Indigenous group also found the involvement of Indigenous peoples in research more beneficial than the non-Indigenous group (question 16) and, to a higher degree, see the knowledge of Indigenous peoples as an untapped resource for scientists (question 17).

## Discussion

Early career Arctic researchers are interested in increased involvement of local Indigenous peoples in their research, as indicated by the results of this survey. They also

believe that involving local Indigenous peoples in research makes for better research and that it is important for sustainable development in the Arctic. Because participation in this survey was voluntary, there is a potential risk for bias toward ECRs who are particularly enthusiastic about this subject. These results are, however, in line with those of [Tondur et al. \(2014\)](#) and [Fritz et al. \(2015\)](#), who also found enthusiasm among ECRs for these questions. Five respondents, however, indicated that Indigenous people had no understanding of either the local environment, history, field safety, or logistics, or that there is no need to involve Indigenous people in research for sustainable development. These respondents all worked in Russia and four of them worked within natural sciences. Although there are several potential reasons why respondents would indicate this, this type of survey makes it difficult to discern for certain the context of these responses. As they gave no extra indication of their opinion in the free response questions, we are unable to further analyze or speak to this small dissenting opinion.

Although half our respondents already had experience in involving Indigenous peoples in their research, the other half had not. Half the respondents indicated that they lacked the knowledge of how to successfully involve Indigenous people in their research, and several challenges preventing successful collaborations between ECRs and Indigenous peoples were identified. Free-text responses showed that ECRs gain this knowledge through hands-on experience, reading, and talking to experts. They identify a wide range of skills necessary for successful collaborations, including previous work experience and personal background. One ECR stated that,

*"I believe that much of the skills needed are very identical to the skills developed in E & O [Education and Outreach]: respect, sharing, openness to mutual learning, awareness of cultural differences, objectivity and clarity, patience, friendship . . ."*

There is a growing body of research supporting their view of the importance of Indigenous involvement for research and sustainability, as well as describing some of the same challenges that we found in this study (e.g., [ACIA 2004](#); [Kouril et al. 2015](#), and references therein). For example, [Chapin et al. \(2015\)](#) stated that collaboration between researchers and Indigenous Arctic peoples is central for stewardship and conservation in the rapidly changing Arctic region, by creating a common understanding of environmental and social issues. However, interviewed representatives of Alaskan Indigenous groups believed that traditional knowledge should be valued equally or greater than other forms of knowledge in matters of survival of Indigenous communities, but experienced difficulties in collaborating with governmental agencies on such issues partly due to a lack of efficient formal mechanisms for shared decision-making ([Stetson and Mumme 2016](#)).

Clear differences in the level of Indigenous involvement in research surfaced when comparing geographic regions and scientific disciplines. Potential explanations for the greater involvement of Indigenous peoples in the North American Arctic research, as compared with research in the Nordic Arctic include higher population proportions of Indigenous peoples in North America and differences in legislation between the regions. There are strong views for and against the effectiveness of imposing specific ethical guidelines. Those in favor see it as a tool to increase Indigenous involvement in research, whereas those against believe a discussion about ethics is more beneficial than establishing actual guidelines ([Jacobsson 2016](#); [Tunón et al. 2016](#)). Our results suggest that the regulations imposed on researchers in North America for collaborations with Arctic communities can be beneficial, despite the challenges that they may pose for ECRs. [Juutilainen and Heikkilä \(2016\)](#) reviewed the difference between ethical reviews for Indigenous research in Canada — with perhaps the strongest guidelines in the Arctic region — and the Nordic

countries. They concluded that discussions on Sami research ethical guidelines in the Nordic countries are still in the early stages, especially in Sweden and Finland, where they are lacking at the national research policy level. The importance of such frameworks should be of interest for future studies. This was highlighted in the free text comments from respondents in the Nordic region when asked what they would need for increasing Indigenous involvement in their research. One respondent shared that

*“published protocols, suggestions, guidelines on how, where and with whom to establish links with Indigenous youth, startup of reciprocal exchange programs between communities and universities” would be useful in increasing Indigenous inclusion in research.*

These results further suggest that there is room to improve assisting ECRs in the Nordic countries to develop ways for increased involvement of local Indigenous peoples in their research, and that much can be learned from North American experiences in the area of collaborations. As the inclusion of local Indigenous knowledge in Arctic science-based decision-making is highlighted as key for sustainable development (among others) in the integrated European Union policy for the Arctic (European Parliament 2017), this should be a priority for researchers in these Arctic areas. With regards to other Arctic regions, such as Siberia and Greenland, the number of respondents working in these areas was not high enough to be included in regional comparisons. Such regional analysis would be desirable for the future.

Social and natural scientists indicated similar experience and similar interest in involving Indigenous peoples in their research, although social scientists rated slightly higher on these two survey questions. Natural scientists, however, rated their knowledge on how to conduct research with Indigenous peoples much lower than the social scientists and were also less satisfied with their involvement of local Indigenous peoples in research. Thus, natural scientists might have a greater need for support or training for successful collaborations. Comments from natural scientists suggest that their research does not always have obvious connections to Indigenous communities. When asked what would increase Indigenous engagement in their research, one natural scientist wrote,

*“Simply the opportunity to interact with Indigenous youth in some capacity; all of my prior work has kept me relatively isolated from the Indigenous population in general such that I interact predominantly with science support staff.”*

As suggested by the survey respondents, several things could be done to raise the involvement of local Indigenous peoples in Arctic research (Fig. 4). More fora for ECRs to meet and network with Arctic Indigenous peoples would help ECRs make the necessary contacts and develop skills and relationships for collaboration. The establishment of frameworks and guides would be useful in areas where such are largely missing, as in the Nordic region. Establishing contacts and networks could also serve as a first step for ECRs to negotiate and planning for the time, financial resources and ideas needed for developing collaborations further.

The respondents to our survey also suggested several ways in which they would like to share their research results, including through the media, school visits, developing community deliverables, and academic channels. ECRs proposed new strategies for sharing their results. One respondent shared,

*“I’ve tried different ways. Something I have never tried but would love to do would be to organize a field trip, where we could share knowledge “in situ”. I do that a little bit when out in the field with*

*guides, but having time without work to do where the sole purpose would be to explain my results would be wonderful.”*

Of course, this study focuses on only one side of the story. The needs, challenges, and expectations of Indigenous peoples are equally important for relationships and collaborations to be successful. Although 9% of our respondents identified themselves as both researchers and Indigenous, a similar survey directed exclusively at Arctic Indigenous peoples generated too few responses to be included in this study. This might reflect insufficient distribution networks, a lack of time or interest, a lack of trust among Indigenous communities towards scientists, or what is known as research fatigue in Arctic communities (e.g., [Gearheard and Shirley 2007](#), [Ford et al. 2016](#)). Our results, however, indicate that there are quite a few Indigenous Arctic ECRs that could possibly help bridge the gap between Arctic Indigenous peoples and future researchers. But they cannot do all the work. One of our Indigenous ECR respondents noted,

*“The inefficiency between researcher/Indigenous partnerships is a two-way fault. Both require an increase in communication capacity, this can be resolved by finding locals who are experienced in western research, though they tend to be over burdened and labelled as the “go to”. As there are more externally based researchers, it may be their responsibility to increase their capacity to engage, communicate, equally involve and partner with communities. This unfortunately requires a significant amount of time, resources (preliminary outreach not always considered by funding organizations).”*

[Tondur et al. \(2014\)](#) listed seven recommendations for how to facilitate relationship building with northern communities, focusing on Canada. Also focusing on research in the Canadian Arctic, [Gantner \(2016\)](#) lists three challenges facing ECRs, including lack of funding for developing ideas together with communities, lack of recognition for non-academic work, and scientific publishing delays associated with community communication and review of results. Based on the input from our survey respondents from across the Arctic, we propose the following recommendations to facilitate ECR involvement with local Indigenous peoples in research, to complement those of [Tondur et al. \(2014\)](#) and [Gantner \(2016\)](#). These are based on both the quantitative results from the survey and the ideas provided in open-ended questions by the respondents. Our recommendations are wider in geographical scope and more general than those of [Tondur et al. \(2014\)](#), as they reflect input from ECRs working across the Arctic in a wide range of research disciplines and local conditions. Furthermore, they target two of the challenges listed by [Gantner \(2016\)](#), but as the survey generated little input on scientific publishing delays associated with community communication and review, none of our recommendations directly targets this challenge. This challenge could however be addressed through the second recommendation in our list.

- Increase fora for ECRs to meet, network, and communicate with Arctic Indigenous peoples. With stronger communication and networks, strategies for increasing collaborations can be made by ECRs and Indigenous peoples together. Such fora and networks should be set up collaboratively with, or be initiated by, Indigenous peoples.
- Develop strategies, guidelines, and support systems for ECRs working in the Nordic region so that they have the tools to increase collaborations with Indigenous peoples.
- Support the training of natural scientists in how to successfully involve Arctic Indigenous peoples in their research.
- Investigate the needs of ECRs working outside the North American and Nordic Arctic regions, which were analyzed in this study, and facilitate the transfer of knowledge between the Arctic regions.

- Further research should be conducted to understand the perceptions and challenges for Indigenous peoples to participate in research activities, especially those of ECRs, to counter-balance this survey.
- For the points above to be effective, funding for ECRs to dedicate time to these issues would be necessary. This should also be true for engaging Indigenous peoples in research efforts.

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## Appendix A

Definition of social scientists and physical scientists applied for splitting respondents into disciplinary groups. The division is based on replies to question 6 ([Appendix B](#)).

Social scientists: Art and Archaeology, Human and Social Development, European studies, Language and Culture, Peace and Conflict Studies, Health and Food Security, Politics, Traditional land use.

Physical scientists: Atmosphere and Climate, Cryosphere, Marine, Terrestrial, Ecology, Freshwater, Life science, Limnology.

## Appendix B

**Table A1.** Demographics of survey respondents (N = 108).

Question	N	%
<b>I am a . . .</b>		
Polar researcher	99	91.7
Polar researcher and Indigenous	9	8.3
<b>Gender<sup>a</sup></b>		
Male	33	30.8
Female	74	69.2
<b>Age group</b>		
18–25	18	16.7
26–35	72	66.7
36–45	15	13.9
46+	3	2.8
<b>Educational background<sup>a</sup></b>		
Bachelor level	13	12.4
Masters level	52	49.5
PhD	23	21.9
Postdoctoral	17	16.2
<b>Current occupation<sup>a</sup></b>		
Student	64	60.4
Researcher	40	37.7
Other	2	1.9
<b>Level of experience in field of Polar Research</b>		
1–3 years	41	38.0
3–5 years	40	37.0
5–10 years	23	21.3
More than 10 years	4	3.7
<b>Have you ever involved local Indigenous people in your research projects?<sup>a</sup></b>		
Yes	53	50.0
No	53	50.0
<b>Region</b>		
Greenland	11	10.2
North America	24	22.2
Russia	12	11.1
Sami	22	20.4
Svalbard	13	12.0
Other <sup>b</sup>	26	24.1
<b>Research area</b>		
Natural science	68	63.0
Social science	27	25.0
Physical and social sciences	6	5.6
Other	7	6.5

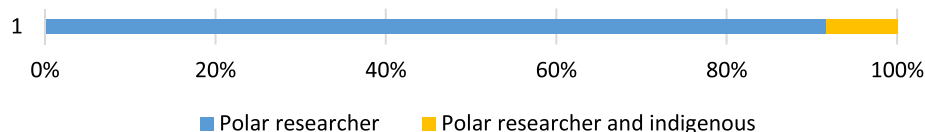
<sup>a</sup>Three or fewer missing values reported.

<sup>b</sup>Including sea ice, ocean, and atmosphere.

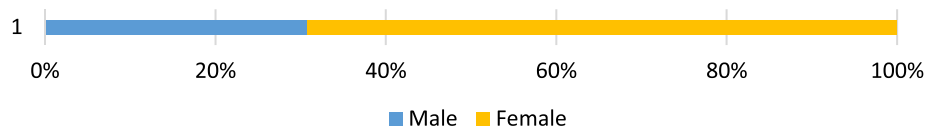
## Appendix C. All survey results summarized for all respondents

The response formats of the questions are indicated in parenthesis after each question. For multiple-choice questions only one answer option was allowed, for tick box questions respondents could choose as many answer options as wished, comment questions were answered with free text, and for rating questions only one answer option on a rating scale was allowed. Note that quotes have been sorted and grouped for easier reading. Colors in the figures follow the same order (left to right) as in the figure legends to facilitate reading when printed in greyscale.

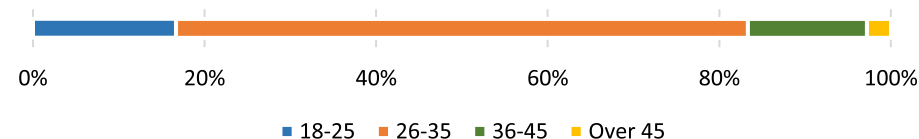
### 1. I am (multiple-choice)



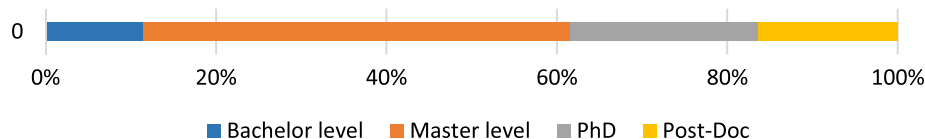
### 2. Gender (multiple-choice)



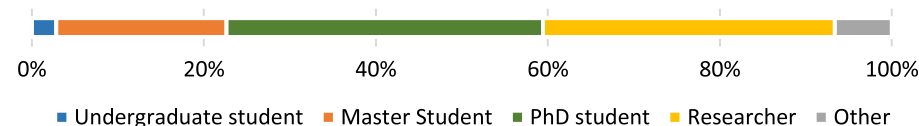
### 3. Age group (multiple-choice)



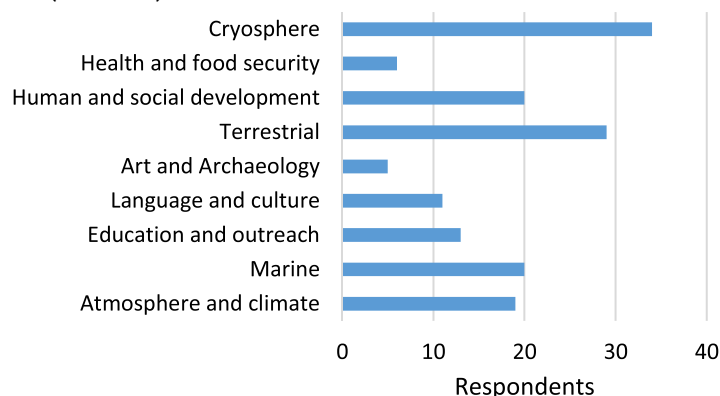
### 4. Educational background (multiple-choice)



### 5. Current occupation (multiple-choice)

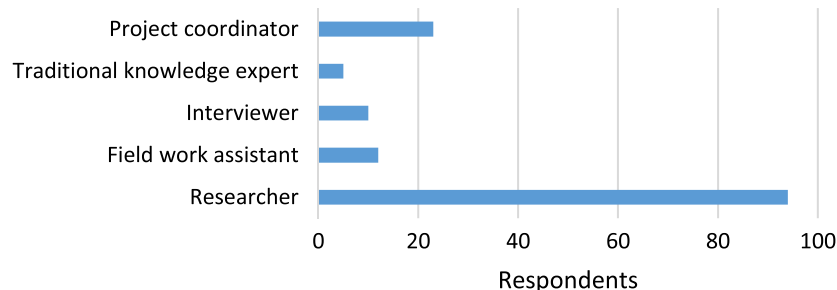


### 6. Research field (tick box)



*Others: Birds biology, freshwater ecology, Tek/Sek integration, politics, climate change adaptation, environmental history, peace and conflict studies, ecology, paleoenvironmental science, pollution, microbiology, Innovation and Technology studies, International relations/European Studies, freshwater, European studies, participative Architectural Process, glaciology, freshwater, engineering, economics, Northern Latitude Agriculture, life science, Limnology and Ecotoxicology, traditional land use.*

**7. Within your current research project, please indicate what is your role. (tick box)**



*Others: Project assistant, translator/interpreter, no current project, Education and Outreach coordinator, at the moment I am not involved in a particular research project, planer.*

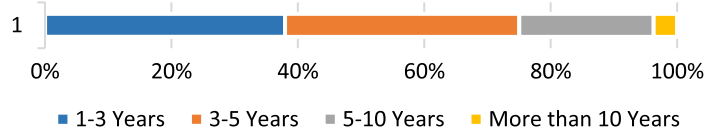
**8. Please indicate the geographic location in latitude/longitude of your research area. (comment)**

See Fig. 1 in the main article.

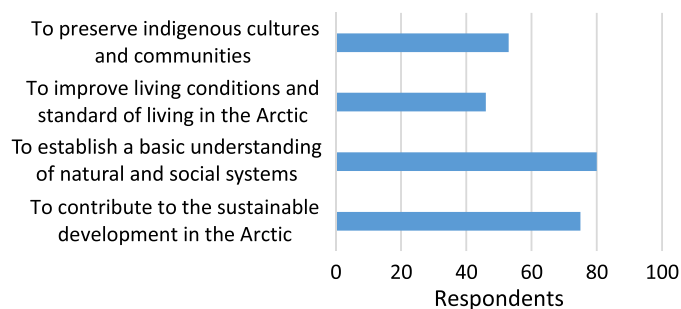
**9. Please indicate the geographic location in latitude/longitude where you live. (comment)**

See Fig. 1 in the main article.

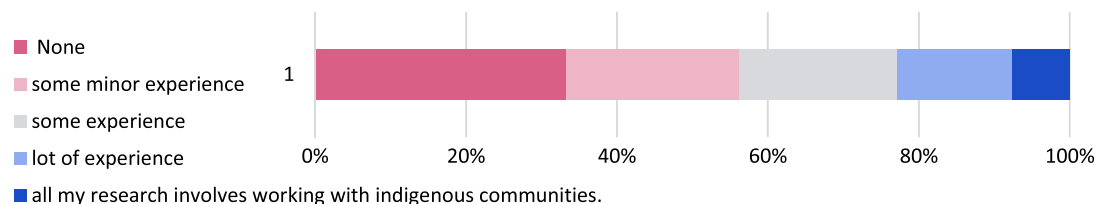
**10. Level of experience in the field of Polar Research (multiple-choice)**



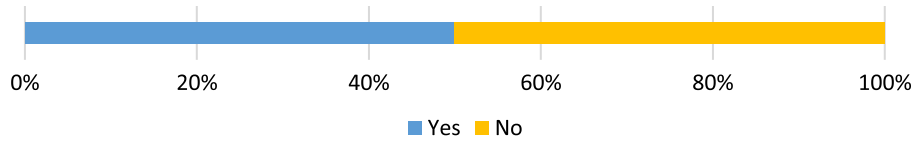
**11. According to you, why is research about arctic areas important? (tick box)**



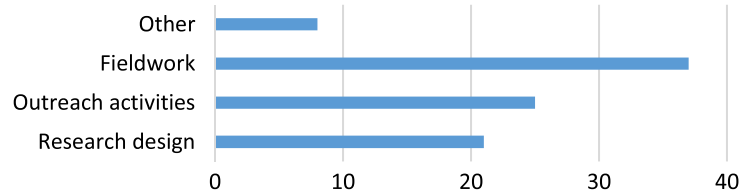
**12. What is your level of experience working with Indigenous people? (rating)**



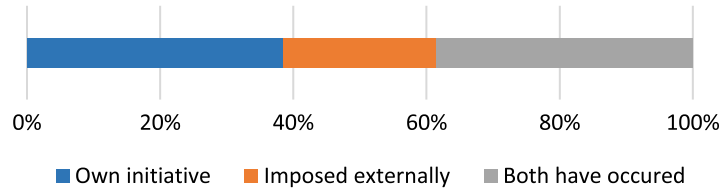
**13. Have you ever involved local Indigenous people in your research projects? (multiple-choice)**



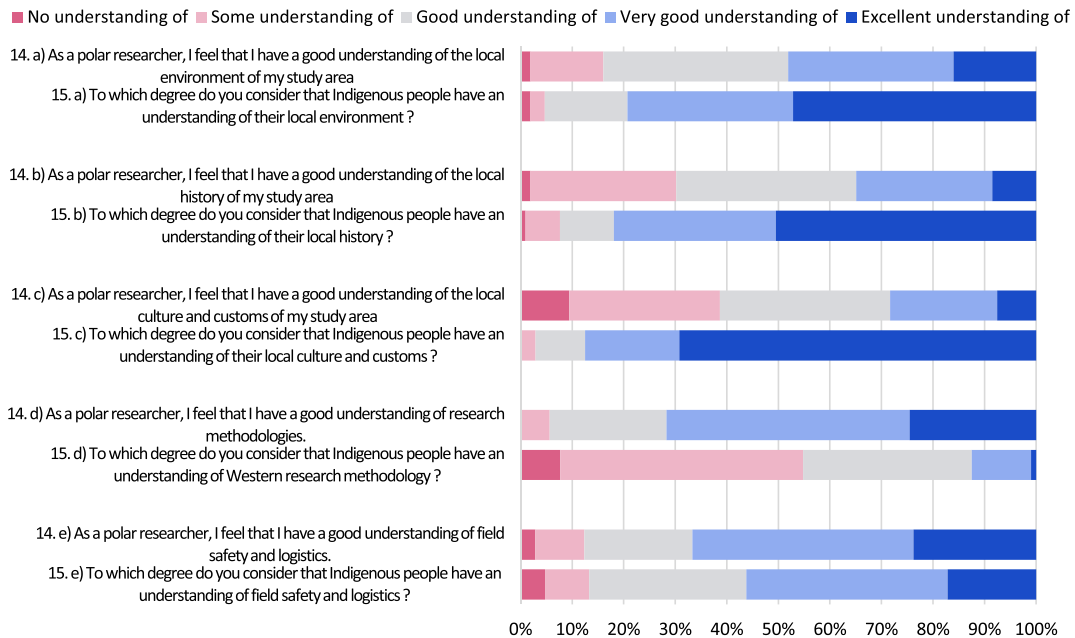
**13. (b) If yes to the previous question, please indicate in which capacity. (tick box)**



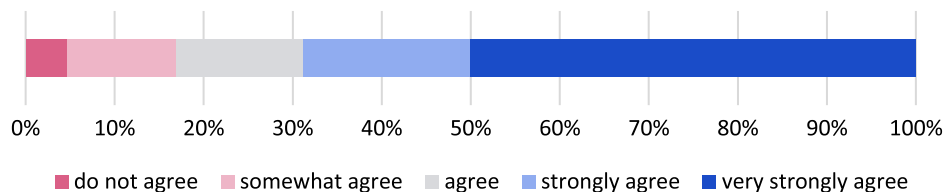
**13. (c) If you have some working experience with Indigenous people, please indicate if it was (multiple-choice):**



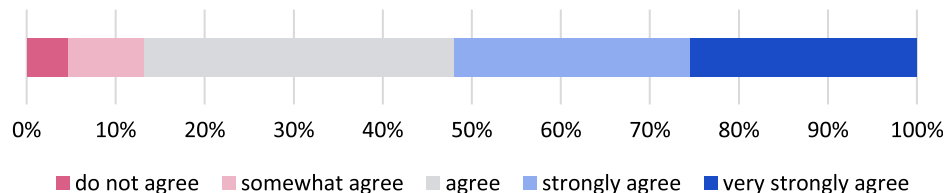
**14. (a) to 15. (e) in Figure below (rating):**



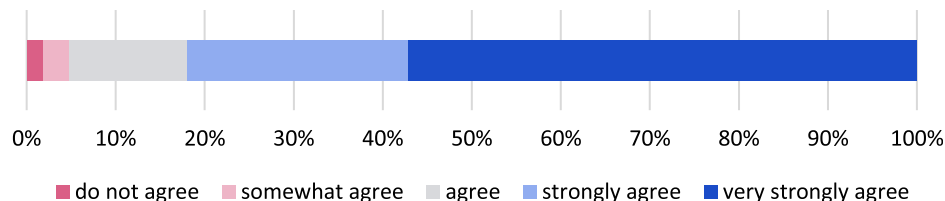
**16. Involvement of local Indigenous people in research can be beneficial to my field of research. (rating)**



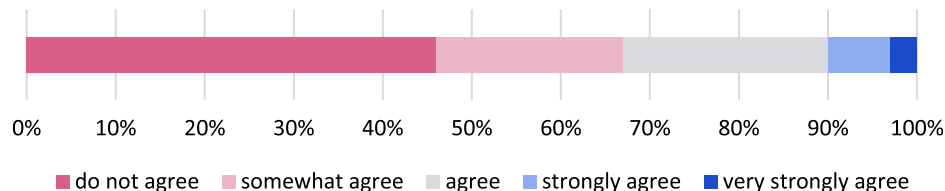
**17. The knowledge and experience of local Indigenous people is generally an untapped resource in polar research. (rating)**



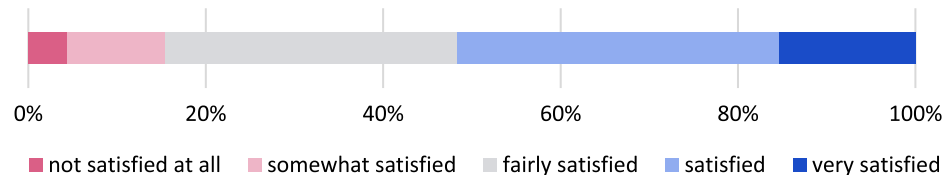
**18. The involvement of local Indigenous people in research is essential for the sustainable development of the Arctic region. (rating)**



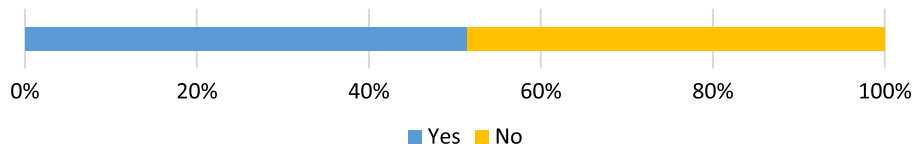
**19. I have experienced conflicts or frustration when working with Indigenous people when conducting my research. (rating)**



**20. Based on your experience, please indicate your general degree of satisfaction when sharing and (or) conducting research with Indigenous communities. (rating)**



**21. Do you feel that you have the basic knowledge of how to conduct research with Northern communities (multiple-choice)?**



## 21. (b) If yes to the previous question, please specify. (comment)

### Work experience

Several comments touched on the relevance of their professional experience for gaining basic knowledge.

"managing the field monitoring sites"

"I have had two years of working with the Inuvialuit and feel comfortable working with the community"

"I have been active in community archaeology, which addresses many pressing issues of knowledge-transfer partnerships, regardless of location."

"Social Science Methods and historic and cultural Background"

"I have only worked on community-based projects in the North"

"Experience in communicating with Sami reindeer herders"

"I have worked closely with Inuit Parks Canada employees conducting my research for 3 years (an employee always accompanies me to my field site)"

"experience from successful projects based on education and outreach approach"

"My Masters program is focused on research in northern communities, so I have a basic knowledge."

### Personal background

Some respondents mentioned their personal background.

"Being from a Northern community, albeit not Indigenous myself, I feel that I am fairly familiar with how to conduct myself and adapt my research approach."

"As a First Nations person from the Yukon, though educated in the south, I am aware of practices and etiquette of working with all involved in research activity (i.e., First Nation's citizens and governments, Federal and Territorial governments and Yukoners in general)"

"Am from the Arctic and have grown up with Inuit Culture, have worked with Inuit communities and inuits and have studied methods"

"I grew up in the North and have been fortunate to attend a northern university."

"I read and speak native language and have lived in their community for ca 12 years."

"Am from the Arctic and have grown up with Inuit Culture, have worked with Inuit communities and inuits and have studied inuit"

### Other

Other comments ranged from level of knowledge, to communication skills, reading and talking to experts, general statements of necessary knowledge, and the need to share science.

"The basic knowledge, yes. Advanced? We'll see."

"I have a basic understanding, but I have much to learn yet. It is also difficult to make such a general statement: each community is different."

"Just the basic. I would not feel free to do it all by myself, but I feel I am starting to have some knowledge."

"I know whom to approach and how."

"I have no special skills but think that common sense is a good start."

"Building upon existing relationships to produce products in an appropriate language/medium/format etc."

"I believe that much of the skills needed are very identical to the skills developed in E & O: respect, sharing, openness to mutual learning, awareness of cultural differences, objectivity and clarity, patience, friendship ..."

"Good communication skills"

"by participatory approach"

"Participatory Observation"

"I have spent a lot of time reading and speaking to people who have worked in Northern communities, particularly the one that I am visiting, and I have begun communications with the IRC to ensure that I appropriately approach and conduct my research."

"Sought advice from experts, and spoke with community before conducting research"

"Read and spoke with researchers, scientists, their work, and interviews"

"based on own travels and readings"

"Years of experience"

"Shared experience of the research group."

"Basic knowledge includes several 'hows': how to establish local contacts, how to build trusting relationship through respect, patience and honesty, how to be self-aware of personal behavior, how to express appreciation"

"You must be thorough, detailed, yet simple in your explanation of research and its implications"

"Since there are no extreme culture-differences in LOY it is easy for me, but from experience working with research in Tansania, I always felt it was easy to get in contact with people, as long as I was prepared to pay respect to their views and beliefs. This does not mean it was not possible to discuss — I had some very good discussions with local where both sides learned a lot — but simply to acknowledge other opinions and realities. The main problem was the high degree of corruption in administration and politics ..."

"We need to share our knowledges with them, so they could be able to make some research for us, knowing the purpose."

"It should be possible to protect the traditional world order and Indigenous Peoples"

"Again a question with little to no sense for quite some natural science topics."

"they are involved in all our field work"

"I'm Scandinavian, and share passion for nature and culture"



## 22. What are your expectations when you involve Indigenous people in your research? (comment)

### Research benefits

Many respondents highlight the benefit of involving Indigenous people to their research.

- "knowledge of local environment, weather forecast, logistics, natural food supply etc."
- "products, data, timeliness of response, expectation of degree, safety, interested participants, mutual respect"
- "Enrichment of the data"
- "My field of research is very directly related to income, tradition and livelihood of local people. Their perception of potential research questions and understanding of local system is of paramount importance to formulating relevant research questions"
- "That they contribute their insights just like anyone else — to be honest the fact that they may or may not be Indigenous is not a key concern in my current research; rather that a representative sample of the community, which of course means inclusion of Indigenous people as well."
- "identify current local challenges and research problems."
- "Decreased logistics expenses"
- "none, they help me and therefore I am thankful that they share their knowledge"
- "Extra value to purely scientific research, new insights into data analysis."
- "Provide various insight regarding research question, guide priorities of research and ensure tangible, action based results are achieved."
- "They would help to understand sites and their importance to locals, the research can be done without harm to communities"
- "get different kind of information. Longer monitoring from the area"
- "experience of understanding the world in the traditional cultures of the Indigenous peoples"
- "Information — material, information, traditions, signs"
- "excellent support"
- "Local knowledge about interesting sites and general patterns, about historical events, traditions, weather and climate conditions. There is considerable knowledge about patterns in fish movements (especially in hunting communities), original ideas (researchers are often trapped inside the methods they learned)"
- "I have no expectations. I HOPE they will be interested in the topics and will participate, and it hope they provide new insights to research I have already conducted, and provide me essential context to move forward with future research."
- "To obtain historic or present info on local permafrost occurrence and behavior"
- "to gain a better understanding of Indigenous approaches in general and to cooperate for research"
- "to get access to the most proximal information and knowledge"
- "I expect to get better holistic view of the research area"
- "Depends very much on the role for which I involve them. As a field guide, I expect a knowledgeable and hard-working team member. But I have very different expectations of elders I consult with regarding research questions and study design."
- "Just learn more and understand what is happening and how it is affecting them"
- "they are willing to share their ideas"
- "Better (and safer) fieldwork, better understanding of the environment and hopefully better research and confidence in the research (by local arctic people)"
- "field work facilities"

### Knowledge sharing

Many respondents highlight the benefit of sharing knowledge and experience.

- "a sharing of knowledge"
- "Knowledge sharing and community consultation and involvement in research"
- "I expect them to help for the field work (travel, safety). I also wish I can learn about their habits and traditions and I like to learn about their history."
- "Knowledge sharing"
- "My expectations are to have cultural exchanges."
- "That we can learn from each other and the partnership is beneficial to both sides."
- "My expectations are to build a research project that will directly benefit the community"
- "My hope is that there is a desire to exchange knowledge and support each other to successfully complete the project. Ideally, both people (Inuit and researchers) would gain valuable insight and skills from working together. I would also hope that the Inuit partners help facilitate sharing any relevant/useful information with the community."
- "Cooperation"
- "Mutual trust and respect"
- "Sharing their knowledge"
- "Tackle important problems that are important for Indigenous people"
- "I would like to learn more about the cultural history of the area I am working in. I expect to be able to give something in return by explaining how past land use influenced the landscape as we see it today."
- "They need to be contributing members of the team, but there has to be mutual respect for Indigenous and Western beliefs and methodologies."
- "to have access to local knowledge, to learn context and appreciation for what i could not see, to assist Indigenous people by sharing any knowledge or access to knowledge ei [sic] may have"
- "To have a good relationship with the people I study/I study with? To gain a better understanding of the ways and the culture of the local communities."

*"That they are interested in my research and want to contribute to my project"*  
*"getting a feeling of community needs, and possibilities in the existing natural environment and human habitat"*  
*"Indigenous people sculpt my research from the onset — they identify what should be researched, and they are part of the entire process."*

#### Benefits to Indigenous communities

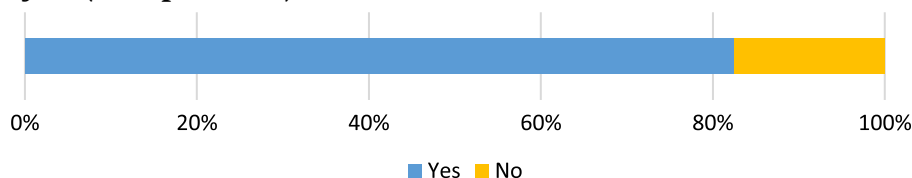
Some comments focus mainly on the benefits for the people they involve.

*"I think they will be happy to assist in the development of research."*  
*"They will learn value of their environment in world scale"*  
*"I have high expectations of myself that I will try and share my work and my passion; any feedback I may get is an added bonus."*  
*"Researcher should support Indigenous peoples knowledge"*  
*"Interest from research participants, increased relevance/value of the research to them"*  
*"improve acknowledgement of native living environment for Indigenous people"*

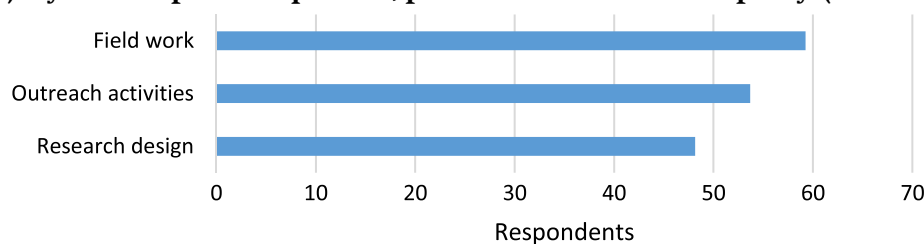
#### Other comments

*"to be patient"*  
*"Initial phase takes time and transparency and common clear rules are paramount"*  
*"Not very high, because there a few that are excellent and understand the importance than there are others who are only using the research as a means to their own ends."*  
*"I don't know"*  
*"Involving Indigenous people is definitely important, but so is involving other northern-based researchers who are well-versed in the science and logistics of the area"*  
*"see linda tuhiwai smith"*  
*"I do not involve Indigenous people in my research"*  
*"It doesn't matter for what I am interested in."*  
*"I have yet to include Indigenous people in my research, but I would like to. The problem is that it hasn't been done before in my field of study, so it is difficult to get other researchers to buy into the idea."*  
*"somewhat open minded"*  
*"curiosity and skepticism"*  
*"That they are engaged and curious"*  
*"воспитания грамотных респондентов"*

### 23. Would you like to have more involvement of local Indigenous people in your projects (multiple-choice)?



### 23. (b) If yes to the previous question, please indicate in which capacity. (tick box)



*Other: perennial monitoring measurements in remote settlements, Formulation of questions, Greater participation in study., Communicating and rallying interest and participation, Logistics + insights to local environment + reindeer grazing behavior + etc., already there. I also need to be a bit independent., data analysis, sharing knowledge, development of equipment that works in the environment, Having more understanding of the cultural history of the research area., development of project ideas,*  
 респондентов

**23. (c) To involve local Indigenous people in your research, what would you need? (tick box)**



**24. How would you like to share your research results with Indigenous communities? (comment)**

**Media**

Several respondents mentioned traditional (and less traditional) media, including social and local media.

"popular lectures, newspapers, TV"

"Appropriate for a multitude of age groups. (1) video off research. (2) videos that show elders stories, data repositories. (3) powerpoints of results provided to village leaders for use in politics or management. (4) book/booklets for public audience"

"Through Northern news media."

"Websites, mass-media (especially television), public lectures, educational programs"

"in form of exhibitions of visual/artistic data collected during fieldwork, also in a form of books and videos translated into native languages (for local museums, centers of culture, educational units, etc.)"

"as much as possible via TV and print media"

"newspaper magazine and a finished building"

"Film"

"Through reports and outreach"

"Through local media"

"Article in the local newspaper"

"publication of research results in journals that are available to local Indigenous people"

**Meetings**

Many respondents highlight the need for personal interactions through meetings and discussions.

"going back and discussing my findings"

"The community that I work with has indicated that the interactive websites and Facebook pages are important for disseminating research results. They also indicated that community meetings are very important."

"conducting lectures and seminars among the population; creation of web-resources for these people"

"Presentations onsite"

"Direct discussions with local people on research results and traditional knowledge."

"By visiting the community, at meetings or social events and sharing my research"

"In a mutually engaging way."

"Presentation at meeting with time for discussion and something that can be given to community in English and their native language"

"Present at community events such as General Assemblies, leadership meetings, youth outreach opportunities (job fairs, school/ classroom presentations), also presentations to larger population including government employees (FN, Territorial, Federal), local academic institutes, also development companies, such as mining."

"Workshops and meetings"

"present results at local meetings"

"conferences, community based monitoring, public debates"

"Attending their meetings and telling about the progress and findings, a very interactive presentation would probably be a good way to share results"

"I plan to return to Pangnirtung (150 km from the ice cap I am working on) to give a community presentation upon finishing my research. Parks Canada is happy to support me by providing lodging and a space for the presentation which will be in English and Inuktitut. I also plan to work with Parks Canada to create pamphlets for visitors/residents summarizing the impact of climate change on Penny Ice Cap using my PhD research results. To date I have given several community talks on my research and have had informal discussions with residents."

"Visits, meetings in the local community"

"Organizing discussions regarding the research findings at the community center."

### **Schools**

Some respondents mention interactions with schools.

*"report back to them, visit schools"*

*"local meetings with schools"*

*"presentations, projects with schools, book for children, comics"*

*"Contacts to schools/kindergarden and local people privately"*

*"It would be nice to have some popular science presentations in the field area, and also at local schools. But there is rarely time for that."*

### **Community deliverables**

Some respondents highlight the need for useful products to deliver to communities.

*"I'd like to share the results or end products with the stakeholders that my research matters to. It is useless for the community to sit in on a ton of random research results if they are not interested"*

*"Provide a 'deliverable' and useful product."*

*"I could create a calendar of low-frequency waves, which might help to better understand what happens to the climate in the near future."*

*"Yes! I am hoping to develop a tool that would be helpful and beneficial for them to use."*

*"Maps, video (oral)"*

*"Firstly, is crucial show why the results are important and how can contribute to the community. In addition, it's important share personally the results and find a way to help the community as well listening what the community say about that."*

### **Academic**

Some respondents mention more traditional academic means of communication.

*"Presentations in the Communities and their participation in conferences (which involve to pay for the Indigenous people to travel)"*

*"Working group, scientific activities"*

*"talk to their academics"*

*"Publication, Presentations"*

*"Through teaching and courses"*

### **Other**

Other comments include comments on creative ideas for communications, the need for discussing communication strategies with local communities, and difficulties in communication strategies.

*"I've tried different ways. Something I have never tried but would love to do would be to organize a field trip, where we could share knowledge 'in situ'. I do that a little bit when out in the field with guides, but having time without work to do where the sole purpose would be to explain my results would be wonderful."*

*"We are hoping to communicate our research results by e.g., an exhibition on reindeer grazing and historical land use in Ajtte sami museum in Jokkmokk"*

*"Documenting field results with video and getting feed-back from Indigenous communities before the final analysis, outreach"*

*"I would like Indigenous researchers from the community to be involved and they share their results with their community"*

*"To have resources to translate the research into their own language, to have their comments and help in mapping future research possibilities/areas"*

*"Hope the Indigenous people to participate my research"*

*"by disseminating my result to the community"*

*"in a way they told me was appropriate and useful"*

*"Through personal communication"*

*"sharing in all states of the research (preparation, field work, work with samples and conclusion)"*

*"Indigenous community is my research partner, sharing results interaction with my own community"*

*"This is struggle with. It ends up being based on community I am in."*

*"I would like to find a more effective method of conveying my research then posters and presentations. I would like to know what they would like. To be beneficial I need to know what type of information would be beneficial for the communities."*

*"I don't know yet"*

*"Don't know"*

*"not differently from other public outreach to general public"*

*"like whit all the other people"*

*"any way possible"*

*"no matter how"*

*"They decide how best to disseminate."*

*"lectures, promotion of the local population of scientific knowledge"*

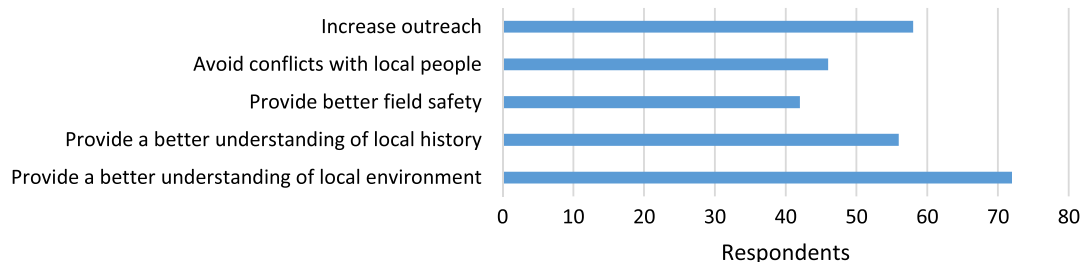
*"Verbally"*

*"outreach activities"*

*"Outreach"*

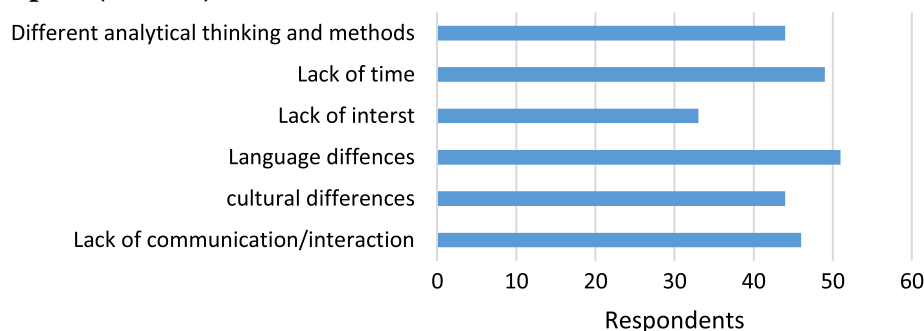
*"печатной"*

**25. How does working with Northern communities benefit your research? (tick box)**



*Other: Expand temporal boundaries of research (actually remove them at all); generating research questions; Create new projects, perhaps in different locations, and new collaborations.; It's motivating!; increased support and unique knowledge/understanding of relationships; Participatory methods in aboriginal community health and well-being; informs research direction and objectives; I would like to point out that my research would not be possible without the support of Inuit Parks Canada staff. They provide very valuable knowledge of traveling safely on the land and winter survival skills; provides logistical support; Come up with better ideas and a more holistic understanding of what is going on; nothing; improves research products; broader research question; assistance from the local population.*

**26. What challenges do you see when (considering) working in the areas of Indigenous Peoples? (tick box)**



*Other: not so much; compensation + ethics; lack of "western" cultural competency and mindfulness; As a young researcher, learning the community structures that can promote sustainability for the research; Lack of local capacity and inherent differences in approaching an issue and the means to resolve this issue. I present this from the point of view as an Indigenous person where many researchers have difficulty communicating their work effectively to communities, either through use of jargon, inadequate consultation/engagement, cultural sensitivity. A common issue is that researchers are unable to portray how their work impacts the community or it simply may not (typically due to lack of engagement during research design phase).; prejudice; Polychronism vs monochronism; lack of money from my side.*

**27. Based on your observations and experience, what elements would contribute to establish fruitful cooperation work between polar ECRs and Indigenous youths? (comment)**

**Meetings**

Several respondents mention the need for in-person meetings.

*"Visiting schools, hands-on workshops or fieldtrips, even weekends away where daily chores mix with the scientific experience."*

*"Networking (via blog and forum). It would be very interesting to have a conference happening in the North, for example in Iqaluit. We could expect a lot of Indigenous people going there since it's closer for them."*

*"Perhaps more fora to meet? E.g., wider events for polar topics, where Indigenous youth would be natural participants, rather than a strict research/academic setting, where it would seem very forced and unnatural."*

*"Simply the opportunity to interact with Indigenous youth in some capacity; all of my prior work has kept me relatively isolated from the Indigenous population in general such that I interact predominantly with science support staff."*

*"As mentioned: job fairs, classroom engagement (if possible on the land with local residents/elders). A connection of their educational outreach intent needs to be made between local values and research values."*

"More interpersonal contact"

"Meetings in local environment, exchange programs"

"Forums and meeting places"

"More forums for researchers to share their experiences and methodologies with other researchers. Hiring local youth to work on projects or to consult in the best ways to disseminate research methods. Youth camps that involve elders and youth at research sites could be helpful for opening dialogues."

"Face to face visits, engaging Indigenous researchers"

"Being able to have time to meet and discuss everyone's needs and aims. Right now, with funding it is hard to make that time. But, it is the first thing to get criticized."

#### **Money**

Only three respondents mention money.

"more financial support for this"

"Money and fame"

"more interaction and propaganda of scientific motivation among Indigenous population (i.e., financial, ideological etc.)"

#### **Contacts, protocols, mentorship**

Some respondents mention the need for networks, contact databases and programs for mentorship.

"networks, make it compulsory to have an Indigenous community involvement in proposal writing"

"way to connect research to what is relevant to them, what they can connect with"

"Better networks, community contact information, 'research advisers', better open dialogue, greater efforts by polar researchers (non Indigenous) to engage Indigenous peoples."

"More and better contact forums"

"a data base that would for instance indicate Indigenous teens who want to get involved, before visiting one could email them and already indicate the research"

"Having local contacts is essential. Perhaps a support network consisting of Indigenous youth leaders could be set up so that ECS would have a local contact to work with (... perhaps this already exists!). That person could act as a guide to help ECR sort out the logistics in town and know how to effectively involve youth in their research."

"published protocols, suggestions, guidelines on how, where and with whom to establish links with Indigenous youth, startup of reciprocal exchange programs between communities and universities"

"mentorship programs, providing financial resources and opportunities to collaborate on research designs"

"ECR's must find a key informant in Aboriginal communities who are capable and willing to work with both the researcher and the community."

#### **Other**

"Establishments of relationships, knowledge sharing vs data mining (Bidirections!) As an example of video/audio repository related to community stakeholders + climate change [jukebox.uaf.edu/site/stakeholders](http://jukebox.uaf.edu/site/stakeholders)"

"implementation of support programs"

"Educational opportunities tailored to their interests"

"Trust (from both parts) seem to be central to good research within my field. This can be established through long-term cooperation, but this needs to be established. Good practice for delivering back information to local communities. This is difficult to establish as a researcher without permanent involvement and access to communities"

"Deep understanding of the cultural differences that make a difference"

"Interest in each other's culture"

"chatting friendly and treated them sincerely"

"give first before asking"

"start cooperation as early as possible (already at kindergarten and school)"

"co-education ... learning from one another"

"actively involved participants on both sides and common goals/shared vision"

"I have made many contacts with Inuvialuit youth in my communities, a few who have worked as field assistants and helped with my research"

"More interest in my research field in the arctic — disability and special education"

"Always be inclusive of the youth in the Arctic regions. They are the future."

"involvement of young Indigenous representatives did the study group, but as a full-fledged colleagues"

"Get them involved with scientific thinking and conservation as early as possible, giving them the opportunity to be involved with simple yet meaningful tasks that could educate them in the need to conserve their resources both biotic and abiotic"

"to share experience and result"

"Conflict resolution skills, acceptance for complimentary knowledge paths, ideally spending time with the communities and especially youth and elders"

"Mindfulness"

"I don't know"

"No idea, not very relevant in my case."

"The same I indicated in question 21"

"See further up under 23 b"

**(29. Would you like to receive information about the results and outcomes of this study.)**

**(28. Other comments (on entire survey))**



## Appendix D

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Results from testing significance of differences between groups. All analyses was performed using SAS 9.4 and Matlab R2016a. Data were reported on a Likert scale of 1–5, where 1 = “No Understanding” and 5 = “An Excellent Understanding.” Because of the non-normality of the data, the Wilcoxon signed-rank test was used. Statistical significance at  $p < 0.05$  was reported (**bold**). NS\* = Not Significant in the  $t$  test, but is significant in the Wilcoxon test.

**Table A2.** Tests for Group differences.

Question	Entire sample (N = 108)	Gender differences			Regional differences			Disciplinary differences			Ind./non-ind. differences		
		Female (N = 74)	Male (N = 33)	p-value	Nordic (N = 22)	North American (N = 24)	p-value	Physical (N = 68)	Social (N = 26)	p-value	Ind.	Non-ind.	p-value
14. (a) As a polar researcher, I feel that I have a good understanding of the local environment of my study area	3.46	3.51	3.34	NS	3.45	3.63	NS	3.40	3.58	NS	4	3.41	NS
14. (b) As a polar researcher, I feel that I have a good understanding of the local history of my study area	3.11	3.11	3.13	NS	2.91	3.25	NS	<b>2.87</b>	<b>3.65</b>	<b>&lt;0.001</b>	<b>4</b>	<b>3.03</b>	<b>0.004</b>
14. (c) As a polar researcher, I feel that I have a good understanding of the local culture and customs of my study area	2.88	2.86	2.91	NS	2.73	3.04	NS	<b>2.54</b>	<b>3.46</b>	<b>&lt;0.001</b>	<b>4</b>	<b>2.77</b>	<b>&lt;0.001</b>
14. (d) As a polar researcher, I feel that I have a good understanding of research methodologies.	3.91	3.99	3.72	NS	3.86	4.00	NS	3.94	3.92	NS	4.33	3.87	NS
14. (e) As a polar researcher, I feel that I have a good understanding of field safety and logistics.	3.75	3.85	3.53	NS	3.90	3.75	NS	<b>3.87</b>	<b>3.28</b>	<b>0.012</b>	4.22	3.71	NS
15. (a) To which degree do you consider that Indigenous people have an understanding of their local environment?	4.20	<b>4.43</b>	<b>3.66</b>	<b>&lt;0.001</b>	4.27	4.63	NS	<b>4.01</b>	<b>4.54</b>	<b>0.0019</b>	4.67	4.15	NS
15. (b) To which degree do you consider that Indigenous people have an understanding of their local history?	4.24	<b>4.48</b>	<b>3.69</b>	<b>&lt;0.001</b>	4.32	4.52	NS	<b>4.11</b>	<b>4.54</b>	<b>0.046</b>	4.33	4.23	NS

**Table A2.** (concluded).

Question	Entire sample (N = 108)	Gender differences			Regional differences			Disciplinary differences			Ind./non-ind. differences		
		Female (N = 74)	Male (N = 33)	p-value	Nordic (N = 22)	North American (N = 24)	p-value	Physical (N = 68)	Social (N = 26)	p-value	Ind.	Non-ind.	p-value
15. (c) To which degree do you consider that Indigenous people have an understanding of their local culture and customs?	4.54	<b>4.76</b>	<b>4.03</b>	< <b>0.001</b>	4.55	4.70	NS	4.48	4.62	NS	4.78	4.52	NS
15. (d) To which degree do you consider that Indigenous people have an understanding of Western research methodology?	2.51	2.60	2.31	NS	2.64	2.43	NS	<b>2.42</b>	<b>2.81</b>	<b>0.036</b>	2.67	2.49	NS
15. (e) To which degree do you consider that Indigenous people have an understanding of field safety and logistics?	3.55	3.67	3.28	NS	3.86	3.88	NS	3.56	3.58	NS	3.89	3.52	NS
16. Involvement of local Indigenous people in research can be beneficial to my field of research.	3.97	<b>4.12</b>	<b>3.63</b>	<b>NS*</b>	<b>4.00</b>	<b>4.63</b>	<b>0.0023</b>	<b>3.61</b>	<b>4.62</b>	< <b>0.001</b>	<b>4.89</b>	<b>3.89</b>	<b>0.021</b>
17. The knowledge and experience of local Indigenous people is generally an untapped resource in polar research.	3.59	3.64	3.48	NS	3.91	3.54	NS	3.46	3.77	NS	<b>4.56</b>	<b>3.51</b>	<b>0.006</b>
18. The involvement of local Indigenous people in research is essential for the sustainable development of the Arctic region.	4.32	<b>4.52</b>	<b>3.88</b>	<b>0.001</b>	4.33	4.67	NS	<b>4.15</b>	<b>4.56</b>	<b>NS*</b>	4.78	4.28	NS
19. I have experienced conflicts or frustration when working with Indigenous people when conducting my research.	2.00	1.94	2.13	NS	1.86	2.45	NS	1.92	1.96	NS	2.13	1.99	NS
20. Based on your experience, please indicate your general degree of satisfaction when sharing and (or) conducting research with Indigenous communities.	3.47	3.55	3.31	NS	<b>3.25</b>	<b>3.91</b>	<b>0.0048</b>	<b>3.33</b>	<b>3.95</b>	<b>0.010</b>	3.89	3.43	NS